

# 40 A Cell Model




**P**eople, plants, and microbes—what do they have in common? They are all made of cells. By 1846, scientists realized that cells were not hollow shapes, like balloons, but were more solid, like gelatin. You may have observed several kinds of cells. In the cheek cell and microbe cell, you could see that there was material inside the cell that can be stained. The material that fills much of the inside of cells is called **cytoplasm** (SIGH-toh-pla-zum). Every cell also has a **cell membrane** that separates it from other cells and from the environment. You can see the cytoplasm and cell membranes of the stained skin cells shown in the photo below. You were probably able to see the cell membrane of your stained cheek cells.

How does a cell membrane work? Find out by creating a simple cell model. You will use a plastic bag to model the cell membrane.

## CHALLENGE

**What is the function of a cell membrane?**



	<h2>MATERIALS</h2>
	<p><i>For each group of four students</i></p>
	<ul style="list-style-type: none"> <li>1 bottle of Lugol's solution with dropper</li> <li>1 30-mL graduated cup</li> <li>2 sandwich bags</li> <li>2 rubber bands</li> <li>2 plastic cups</li> <li>1 plastic teaspoon</li> <li>1 dropper</li> <li>1 SEPUP tray</li> <li>1 stir stick</li> <li>1 sheet of white paper</li> <li>cornstarch</li> <li>water</li> </ul>

## PROCEDURE

1. Label the plastic cups as "Cup 1" and "Cup 2."
2. Use the graduated cup to pour 100 mL of water into each of these cups.
3. Add 7 drops of Lugol's solution to Cup 1.
4. Add 1 level teaspoon of cornstarch to Cup 2 and stir until mixed.
5. In your group of four, have one pair of students complete Step 5a, while the other pair completes Step 5b:
  - a. Use the graduated cup to pour 30 mL of water into a sandwich bag. Then add 7 drops of Lugol's solution to the water in the bag.
  - b. Use the graduated cup to mix 30 mL of water with one teaspoon of cornstarch. Stir and then carefully pour the mixture into a sandwich bag. Be careful to avoid getting cornstarch on the outside of the bag. If there is cornstarch on the outside of the bag, rinse the bag under cold water.
6. Use rubber bands to seal the bags.



**Figure 1: Initial colors of the mixtures.**

- 7.** Place the bag containing cornstarch into Cup 1 and the bag containing Lugol's solution into Cup 2, as shown in Figure 1. Then place the cups on the sheet of white paper and leave them there for 10–15 minutes. As you wait, complete Steps 8–10.
- 8.** Create a data table to record the initial and final color of each solution, both inside and outside of the model cells in both cups. Be sure to record your initial observations.
- 9.** Complete Steps 9a–c to find out how Lugol's solution reacts with starch.
  - a.** Place 5 drops of water into Cup 1 and 5 drops of water into Cup 2 of the SEPUP tray.
  - b.** Use the stir stick to add 1 scoop of cornstarch into Cup 2 and stir.
  - c.** Add 1 drop of Lugol's solution to each cup.
  - d.** In your science notebook, record the color of Lugol's solution when starch is present.
- 10.** Complete Analysis Question 1.
- 11.** After 10–15 minutes (or longer), lift the bags out of the cups and look carefully at all of the solutions. Record any changes that have occurred either in the bags or in the cups.



## EXTENSION

Model a cell by using a real membrane from an egg. An egg can be “de-shelled” by soaking it in vinegar, leaving the rest of the egg intact. Be careful, the “de-shelled” egg is fragile. You can then place the de-shelled egg in different liquids, such as water, food coloring, paint, or corn syrup. Leave the egg in a solution for several days to find out if particles pass through the membrane. Collect data on these changes by measuring the mass of the egg before and after its soak.

## ANALYSIS

1. **a.** Draw a diagram of the cell model used in this activity.
- b.** Label the part of the cell model that represents the cell membrane and the part that represents cytoplasm.
- c.** Label the part of the model that represents the environment outside the cell.
2. Review your results. Describe which part(s) of the lab set-up showed a reaction between Lugol’s solution and starch.
3. Summarize your results by answering the following questions:
  - a.** Which particles—starch or Lugol’s—were able to cross the model cell membrane? Explain how the experimental evidence supports your answer.
  - b.** Which particles—starch or Lugol’s—were *unable* to cross the model cell membrane? Explain how the experimental evidence supports your answer.
4. Based on your cell model, what is the function of the cell membrane?
5. Think about the fact that cells are alive. Why is it important for particles to be able to pass through the cell membrane?

